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CYBERMEDICINE: MAINSTREAM MEDICINE BY 2020/CROSSING BOUNDARIES

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[C]yber[m]edicine is the discipline of applying the Internet to medicine. The field encompasses the use of global networking technologies to educate, innovate and communicate in ways that promote medical practice, commerce, scholarship and empowerment.

An offspring of the information revolution, cyber[m]edicine is rapidly transforming medicine into a virtual marriage of fields as disparate as the medical sciences, business and commerce, electronics, psychology, philosophy and health economics. As we progress deep into the 21st Century, comprehension of the impact of this new discipline on the near future and demands an integrative mind, as asset rare in today's culture of super-specialization.

Cyber[m]edicine is creeping into the medicine of today, but it will swiftly become the medicine of the very near future, evolving from contemporary traditional and alternative medicine. Nearing its potential, it will then mutate into a wholly different and global discipline, which is powerful, efficient and consumer friendly, incorporating individual and cultural wisdom of world experts. And, as it revolutionizes the structure of medicine, cyber[m]edicine will ultimately offer untold benefits to every facet of medical care, even in global locales where healthcare is woefully deficient, cyber[m]edicine is not a sub-set of something else: it is the embodiment of 21st Century medicine.

Individuals and institutions are stuck in thought-ruts, perusing one, two or a few narrow pathways into the future. Review of the literature substantiates the lack of an integrative perspective. Rewards and advantage will go to the one who sketches the whole from seemingly unconnected parts. That sketch will come from the cyberMedicine

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artists.[3]

In this special cybermedicine issue of *The John Marshall Journal of Computer & Information Law*, we are pleased to have the opportunity to discuss cybermedicine from a physician's perspective. As important as the legal issues of cybermedicine are, they must be seen in the context of what cybermedicine will be from a medical standpoint and from the point of view of the patient. Rather than viewing the law as an inhibitory or modulating influence, within the next decade, we will be studying the ways in which the law facilitates cybermedicine and tele-medicine.

Taking on the role of medical futurists or soothsayers, one of our first tasks is to dispel the notion that the cybermedicine revolution is far off. Almost everyone reading this article will be alive to see the realization of cybermedicine play out in less than two decades. By the year 2020, medicine will be completely transformed by cybermedicine as described in the quotation above.[4]

The integrative perspective - crossing boundaries - is key to cybermedicine. This means not only sharing concepts among medical disciplines and eventual redefinition of medical subspecialties, but also incorporating ideas from areas outside medicine, including law. Nor should one forget politics. In his 1999 book "Code," Lawrence Lessig, law professor at Stanford University, points out that software engineers, as Percy Bysshe Shelley once said of poets, are the unacknowledged legislators of our time.[5] We must acknowledge this reality[6] and try to shape it.

It is uncanny how often discussions about the Internet contain a note of uncertainty "I am not sure that. . . ."[7] The fact about cybermedicine to be emphasized, above all others, is the certainty that it will become the driving force in medicine.[8] We predict that the "cyber" in cybermedicine and the "e" in e-medicine will be quickly dropped and that soon almost all of medicine will contain elements of what we now know as cybermedicine and e-medicine.[9] The forces propelling us toward that

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3. cyberMedicine, *Enhancing Health Issues of the Internet Across All Areas of Medicine: Definition of cybermedicine* ¶¶ 1-4 <http://www.cyber-medicine.org/Define.htm> (accessed July 10, 2001).

4. *Id.*

5. Lawrence Lessig, *Code and Other Laws of Cyberspace* 7-8 (Basic Bks., N.Y., 1999).

6. *Id.*

7. *See generally* JMIR, *Evidence-based Patient Choice & Consumer Health Informatics in the Internet Age Journal of Medical Internet Research* <http://www.jmir.org/2001/2/e19/> (accessed Mar. 29, 2002).

8. bmj.com, *The impact of informatics: Shopping around the internet today and tomorrow: towards the millennium of cybermedicine* ¶ 8 <http://bmj.com/cgi/content/full/319/7220/1294> (accessed Mar. 29, 2002).

9. *See generally* Telemedicine, *Connecting the Medical Community Online: The Development of Cyber-Medicine.Org* <http://telehealth.net/interviews/solez.html> (accessed Mar. 29, 2002).

end are so strong that legal and regulatory influences will have only a minor inhibitory effect in the long run.[10] Cybermedicine activities are going on in virtually every part of the world from the steaming Amazon jungle of Brazil to the high mountain vistas of Tibet and affect all sectors of society from the homeless person using a free library cyber-cafe to the national leader discussing heath policy in an online forum.[11] Therefore the situation is entirely different from that in much narrower fields such as stem cell transplantation and cryptography where legal and regulatory influences have significantly curtailed activity and delayed expected advances by many years.[12]

The recent Pew Internet & American Life Project report provides abundant evidence that use of the Internet has played a role in "revolutionizing the more than $1 trillion health care industry in America."[13] "Surveys conducted in July-August 2000 show that the Internet has become a valued source of health-care information for a substantial number of Internet users."[14] Fifty-two million adult Americans, fifty-five percent of the Internet-user population, have turned to Internet sources to seek health information.[15]

> More Internet users have sought medical information on the Web than have shopped online, looked up stock quotes, or checked sports scores. Twenty-nine percent of individuals seeking health information on the Internet, or about fifteen million people, go online to look for medical information about once a week and thirty percent go online once per month.[16]

Similar data is not available for Canada, but numbers there would likely be even higher since a larger proportion of Canadian homes have

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10. *Id.*

11. StudentBMJ, *Shopping around the internet today and tomorrow: towards the millennium of cybermedicine* § User demographics <http://www.studentbmj.com/back_issues/1299/new_tech/new_tech1.html> (accessed Mar. 29, 2002).

12. *See generally* David Banisar, *Stopping Science: The Case of Cryptography,* 9 Health Matrix: J. of L. Med. 2, 253 (Summer 1999); *see also* G. Vogel, *Stem Cell Policy: Can Adult Stem Cells Suffice?* 292 Science 1820-22 (2001); *see generally* National Institute of Health Guidelines for Research Using Human Pluripotent Stem Cells <http://www.nih.gov/news / stemcell/stemcellguidelines.htm> (accessed Nov. 15, 2001); *see also* Jeffrey Kahn, *The Politics of Stem Cell Research; Looking for Middle Ground in a Minefield* <http://www.cnn.com/2001 /HEALTH/06/25/ethics.matters/index.html> (June 25, 2001); *see also generally* Kate Snow, *House GOP Lawmakers Push Prohibition on Stem Cell Research* <http://www.cnn.com/2001 /ALLPOLITICS/07/03/stem.cell/index.html> (July 3, 2001).

13. Susannah Fox & Lee Rainie L., et al., The Pew Internet and American Life Project: *The Online Health Care Revolution: How the Web Helps Americans Take Better Care of Themselves* 8 (Nov. 26, 2000) (available at <http://www.pewinternet.org/reports/pdfs/PIP_Health_Report.pdf>).

14. *Id.*

15. *Id.*

16. *Id.* at 8-9.

broadband Internet connections than in the U.S., and it is the Canadian federal government's vision and plan to make Canada the most connected country in the world.[17]

The nature of the current health care system provides strong incentive for seeking medical information on the Internet.[18] "A typical doctor's visit has reportedly shrunk to less than 15 minutes, and many patients leave their physician's office without getting all their questions answered."[19] A 1999 survey by Yankelovich Monitor

> found that half or more of Americans are not satisfied with the availability of their doctors or with the duration of time spent with their doctors. Not surprisingly, many Internet users have turned to the Web to provide the information they find hard to get from their physicians and have become increasingly interested in participating in what the medical community calls shared decision-making.[20]

E-mail communications play a pivotal role in cybermedicine and will transform health delivery.[21] E-mail access is more universal and less dependent on speed of connection than Web access.[22] E-mail is the simplest of "push" technologies. Unlike a WWW site, the user does not need to actively seek the information to receive e-mail; it automatically appears in the user's e-mail inbox.

Cybermedicine e-mail communications can be doctor-to-doctor, doctor-to-patient, patient-to-patient and patient-to-doctor. These types of communications largely eliminate the "tyranny of the telephone" by allowing messages to be read and answered when it is convenient for the user.

It is interesting to consider the word "disruptive" applied to Internet communications. On the one hand, e-mail and the Web are the least disruptive of modern modes of communication, easily integrated into other activities. On the other hand they are classic examples of "disruptive technologies" (as opposed to "sustaining technologies") as defined by

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17. *See generally* David Ellis & Duncan McKie, *Connected Canadians. . .What they think, what they do* <http://www.omnia.ca/content/nmp_08.2000.shtml> (accessed Nov. 15, 2001); *see generally* Cyberatlas, Big Picture, Geographics, *Canadian Net Demographics Shifting Fast* <http://www.cyberatlas.internet.com/big_picture/geographics/article/0,,5911_434711,00.html> (Aug. 10, 2000); *see generally* J. Chrtien, Connecting Canadians: *Message from the Prime Minister of Canada* <http://www.connect.gc.ca/en/ar/1016-e.htm> (Apr. 2000).

18. Fox, *supra* n. 13, at 8.

19. *Id.*

20. *Id.*

21. *See generally Cybermedicine* <http://gsulaw.gsu.edu/lawand/papers/su01/taylor_west/> (accessed Mar. 29, 2002).

22. Robert H. Anderson, Tora K. Bikson, Sally Ann Law, & Bridget M. Mitchell, *Universal Access to E-Mail Feasibility and Societal Implications* § Universal E-Mail <http://www.rand.org/publications/MR/MR650/mr650.ch1/ch1.html#ch1.h2> (accessed Apr. 3, 2002).

Harvard Business School's Clayton Christensen in his book "The Innovator's Dilemma."[23]

As described by Christensen, "disruptive technologies" are technologies that "result in worse product performance, at least in the near term", but ultimately win the day.[24] Disruptive technologies are counterintuitive in respect to traditional customers wishes, and "bring to market a very different value proposition than had been available previously."[25] Initially products based on disruptive technologies under-perform established products in mainstream markets, but have other features which eventually triumph: they are cheaper, simpler, smaller, and often more convenient to use.[26]

Reading Christensen's intriguing 225-page treatise one recognizes that the word "disruptive" is not pejorative.[27] In fact many of the other marvels of modern society are also disruptive technologies: the computer disc drive, discount retailing and home centers, tabletop photocopiers, mini mill steel technology, and hydraulic excavation machines (power diggers).[28] With all of these technologies the rules were so different that the big companies using older technologies were completely "blindsided" and left behind when they followed the accepted rules of listening to customers and following the business plan.[29]

Kent Anderson of the American Academy of Pediatrics writes passionately about the impact of the "disruptive technology" of the Internet and the future of medical journal publishing in an article *From Paper to Electron* in the Journal of the American Medical Informatics Association.[30] An important bottom line is that the future may well be better than the present, but will be characterized by radically altered market forces, profit expectations, and business models.[31]

The electronic medical record or "chart" represents a cyber-revolution similar to that occurring in medical publishing. Despite great promise it has thus far not been very successful in North America,[32] although penetration in some European countries such as The Netherlands is very

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23. Clayton Christensen, *The Innovator's Dilemma:When New Technologies Cause Great Firms to Fail* XV (Harvard Bus. Sch. Press, Boston, 1997).

24. *Id.*

25. *Id.*

26. *Id.*

27. *See generally id.*

28. *See generally id.*

29. *See generally id.*

30. Kent Anderson, *From Paper to Electron: How an STM Journal Can Survive the Disruptive Technology of the Internet,* J. of the Amer. Med. Informatics Assn. 7, 234-45, § 6 (2000).

31. *Id.* § 1.

32. *See generally* I.S. Kohane, *The Ever Imminent Electronic Medical Record,* 16 J. Med. Prac. Mgt., 264-65 (Mar.-Apr. 2001).

high.[33] The situation within the U.S. will likely change with the new Health Insurance Portability and Accountability Act ("HIPAA") Privacy Rule announced by President Bush on April 12, 2001,[34] which for the first time establishes that the medical record is the property of the patient. This sharing of the medical record between patient and health care providers, with possible revision of the record at the request of the patient, is probably unworkable unless the record is in electronic form. So the twenty-four months allowed for full compliance with the Privacy Rule likely means that there would be widespread use of electronic medical records as well as means of assuring their confidentiality by April 2003.[35] Here again the dynamic is a push toward rather than away from technology.

Telemedicine, providing or conveying health services, clinical information, and/or education over a distance using telecommunication technology, existed long before the Internet and World Wide Web.[36] The term was first used thirty years ago but telemedicine activities date back to the beginning of the last century.[37] The first transtelephonic "electrical stethoscope" was demonstrated in England in 1910.[38] The first electronic transmission of radiographic images occurred between West Chester and Philadelphia, Pennsylvania in 1950.[39] Today Internet based telemedicine is well established in dermatology, radiology, psychiatry, pediatrics, and primary care.

THREE EXAMPLES OF CYBERMEDICINE

Three examples of cybermedicine resources for patients and patients' families illustrate the enormous power of these new technologies.

EXAMPLE ONE: NEPHKIDS, an e-mail discussion group for parents of children with kidney disease moderated by Drs. Sue Conley and Melissa Gregory as a part of the NKF cyberNephrology initiative.[40] This

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33. *See generally* A.H. De Wal, R. Smith, G. Van Der Werf, & B. Meyboom-De Jong, *Towards improvement of the accuracy and completeness of medication registration with the use of an electronic medical record,* 18 Fam. Prac., 288-91 (June 2001).

34. Ellen Messmer, *HHS Lets HIPAA Health-Privacy Rules Take Effect, But Promises Change* ¶¶ 3-5 <http://www.nwfusion.com/news/2001/0411hipaa.html> (Apr. 12, 2001).

35. *See generally id.*

36. Marlene Maheu, Pamela Whitten & Ace Allen, *E-Health; Telehealth, and Telemedicine: A Guide to Start-Up and Success* 4-7 (Jossey-Bass, S. F., 2001).

37. *See* Thomas R. Willemain & Roger G. Mark, *Models of Remote Health Systems,* 8 Biomedical Sci. Instn. 9-17 (1971).

38. S.G. Brown, *A Telephone Relay,* J. of Instn. of Elec. Engr., 590-619 (May 5, 1910).

39. J. Gershon-Cohen & A.J. Cooley, *Telediagnosis,* 55 Radiology 582-87 (1950).

40. *See generally,* Nephkids, *Cyber-Support Group for Parents of Children with Kidney Disease,* § Who We Are <http://cnserver0.nkf.med.ualberta.ca/nephkids/start.htm> (accessed July 10, 2001); *see also generally Cyber Nephrology Homepage* <http://www.cybernephrology.org> (accessed July 10, 2001); *see also generally* Am. Acad. of Pediatrics,

group allows parents all over the world who have children with renal disorders to discuss common concerns and experiences with each other, and with pediatric kidney specialists.[41] The group has been enormously successful and participants are planning to write a book about the positive effect the group has had on their lives and those of their children.[42] When NEPHKIDS began in 1998 a number of the potential problems were envisioned associated with facilitating direct parent-physician interaction and empowering parents but interestingly none of these problems have actually arisen.[43] The fact that NEPHKIDS is an e-mail resource means that it is readily available to families with Internet connections anywhere in the world with no requirement for a high bandwidth connection.

EXAMPLE TWO: Hopkins Teen Central described by Johnson et al., is a combined Web and e-mail based support system for children with cystic fibrosis.[44] The authors measured the effects that "such a support site could have on patients' relationships with the clinic faculty and staff, access to and interaction with peers with cystic fibrosis, and understanding of cystic fibrosis."[45] At the conclusion of the study, "participants believed that they had more friends who they could relate to than they did at the beginning of the study" and "expressed a desire to get together to meet each other."[46] The authors concluded that teenagers with a chronic disease will actively participate in an e-mail discussion group.[47] The social and expressive aspects of their involvement with such a support group hold much promise.[48]

EXAMPLE THREE: The Experience Journal, is the Web resource described by DeMayso, Gonzalez-Heydrich et al.[49] Here multimedia presentations including graphics, video, and audio from families with children with congenital heart disease are arranged like "flowers on a

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Section on Computer and Other Technologies (SCOT) <http://www.aapscot.org/> (last updated Oct. 2, 2001).

41. Nephkids, *supra* n. 40, § Who We Are.

42. *Id.*

43. *Id.*

44. *See generally* Kevin B. Johnson, Russel D. Ravert & Andrea Everton, Pediatrics, *Hopkins Teen Central, Assessment of an Internet-Based Support System for Children with Cystic Fibrosis,* 107 Pediatrics (2) e24 <http://www.pediatrics.org/cgi/content/full/107/2/e24> (accessed July 10, 2001).

45. *Id.* at ¶ 1.

46. *Id.* at ¶ 3.

47. *Id.* at ¶ 4.

48. *Id.*

49. *See generally* David Ray DeMaso, Joseph Gonzalez-Heydrich, Julie Dahlmeier Erickson, Vellisse Pagan Grimes & Carol Strohecker, The Experience Journal: *A Computer-based Intervention for Families Facing Congenital Heart Disease,* 39:6 J. Am. Acad. Child Adolesc. Psych. 727-34 (June 2000).

pond" with stories with similar content grouped together on the page.[50] This is a psycho educational intervention based on a narrative model involving the sharing of personal stories about an illness.[51] Semi-structured interviews revealed that use of this resource resulted in an increase in participants' understanding of heart disease and in how supportive family members were of each other.[52] The Experience Journal is an example of a high bandwidth requiring resource that works well in this relatively affluent group of families who not only have fast Internet connections but also the expertise to create multimedia content.[53]

The physicians responsible for all three of these initiatives have confirmed that no legal or regulatory difficulties have arisen in the creation or maintenance of the resources. The fact that the potential problems often written about do not become problems in real life probably relates to the absence of a motive for anyone to interfere with these very positive online activities. These three resources also illustrate another counter-intuitive feature of cybermedicine: the importance of the individual. Despite claims of the dehumanizing and distancing effects of the Internet, these online resources allow the writing of individual patients, parents, and physicians to have a global impact that could not be achieved by any other means.

Anthropologist Ray Birdwhistell has estimated that only thirty-five percent of human communication is contained in words.[54] The rest is gesture, body language, inflection, facial expressions, pheromones etc.[55] (Birdwhistell noted twenty-three different "meaningful" eyebrow positions!).[56] It is argued "You can't hug someone over the Internet." This statement is technically untrue, sites such as http://www.postcards.org and others actually offer the possibility of conveying a greater variety of hugs than one could ever think of in person.

The possibility of total immersion in the virtual experience is approaching.[57] Through improvements in technology and bandwidth cues of videoconferencing and virtual reality will make people feel increasingly connected. For instance, better buffering and connection speed in Internet video will improve synchrony and naturalness of audio and lip

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50. *Id.* at 729.

51. *Id.* at 728.

52. *Id.* at 729.

53. *See generally* Bandwidthplace, *Your Internet Speed Test Center* <http://www.band widthplace.com/speedtest/> (accessed Nov. 18, 2001).

54. *See generally* Ray Birdwhistell, Kinesics and Context: Essays on Body Motion Communication (Phila. U. of Pa. Press 1970).

55. *See generally id.* .

56. *See generally id.*

57. *See generally* Karen Kaplan, *A Virtual World of Sight, Sound and Even Smell,* Intl. Herald Tribune (Feb. 12, 2001) (available at <http://www.iht.com/cgi-bin/generic.cgi?tem-plate=articleprint.tmplh&ArticleID=10344>).

movements increasing the effectiveness of Internet psychotherapy and speech therapy.[58] Images will be in 3-D, enhancing the performance of tele-surgery and other visually intensive cybermedicine activities.[59]

Exactly when the "fully immersive Internet" will be arrive is a balance between two forces: improving technology and human being's increasing ability to detect ever more subtle differences between the real and the virtual world. In the early days of cinema at the beginning of the last century, people ran out of the theater when a train was coming right at the camera.[60] That no longer happens because human beings have learned the difference between movie images and real trains. We have reached the point where virtual sound is almost indistinguishable from real sound, and we will eventually reach the same point with virtual touch, virtual smell etc., all of which will impact on cybermedicine.[61]

If the imperfect "human" side of the Internet were a barrier to cybermedicine one would expect that the most human of the medical disciplines, psychiatry, to adapt poorly to new technology. Yet psychiatry was an early adopter of Internet technology and tele-psychiatry is today quite successful.[62]

Thirty-one percent of Americans now have broadband Internet access, most of them at work but increasingly at home, according to a new study from Arbitron Inc. and Coleman.[63] For the rest of the world, with only a telephone modem connection or no connection at the moment, low bandwidth options for cybermedicine need to be considered. Here e-mail discussion groups are the major vehicles. First described in the medical literature thirteen years ago, such groups have a pivotal role in cybermedicine.[64] In part because e-mail access is almost universal, e-mail discussion groups have been amazingly successful cybermedicine tools as in the three specific examples given above.

The fear of cybermedicine that exists among physicians, patients, medical publishers, regulatory agencies, and lawyers is largely a fear of the unknown. As outlined above cybermedicine is rapidly entering the realm of the "known" and probably represents a danger only to those who

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58. *See generally id.*

59. *See generally id.*

60. *Id.* at ¶ 19.

61. *Id.* at ¶¶ 19-20.

62. *See generally* Am. Psychiatric Assn. Practice of Psychiatry, *Telepsychiatry* <http://www.psych.org/pract_of_psych/telepsych.cfm> (accessed Nov. 18, 2001).

63. Arbitron Inc. & Coleman, *Nearly One-third of American Internet Users Have Access to Broadband According to Arbitron and Coleman Study* ¶ 2 <http://cf.us.biz.yahoo.com/bw/010621/2188.html> (June 21, 2001).

64. *See* Donald Parsons, *Telecommunication Discussion Groups for Health Services and Medical Research*, The Lancet 867, 1087-89 (1989); *see also* Vincenzo Della Mea, Internet Electronic Mail: *A Tool for Low-Cost Telemedicine*, 5 J. Telemedicine Telecare 84-89 (1999).

ignore it as a trend. Careers in cyberlaw are very promising. Regional licensing limitations will be overcome in law just as in medicine.

There are many positive new technologies which are factors propelling medicine toward cybermedicine: genomics, proteomics, nano-technology, robotic medicine, telemedicine, machine-translation breakthroughs, the medical publishing revolution, and new 3-D imaging techniques. Ray Kurzweil's prediction that in twenty years, there will be flawless machine translation from one language into another has enormous significance for human interactions in medicine.[65]

To a large extent, the answer to the question of how to pay for cybermedicine advances is "no problem!" when one considers the impact of the same technologies on human interactions outside of medicine. In the case of nano-technology for instance, medical applications could be quite expensive, but think of nano-technology's impact on the fashion, home decorating, automobile, space exploration, and entertainment markets and the trillions of dollars those markets represent.[66] Medicine will ultimately benefit greatly from nano-technologies developed for these other markets. Think for instance of the likely expenditures for digital paint that would allow a person at the push of a button to make the appearance of their walls and furniture whatever they wished, or digital clothing, and it quickly becomes apparent that the financial requirements of cybermedicine are miniscule in comparison!

The inevitability of the cybermedicine revolution and the fact that it is mainly a change for the best mirrors the beneficial effects of technology in the world at large. It may initially sadden the reader to know for instance that in Australia, ornithologists have discovered that the country's so-called "mimic birds" are starting to use cell phone noises in place of their traditional mating calls.[67] While shattering certain nostalgic feelings about bird songs, this transformation is not in itself a bad thing. Birds with these singing abilities may have a selective advantage over others, and they represent the vanguard in the evolution of stronger productive ties between nature and machines.

And for those who sometimes see technology as leading a mad plunge into darkness, it is interesting to consider the opposite possibility. It is technology that poet/singer Leonard Cohen is seeing as mankind's salvation in the song *The Great Event*, when he has the synthesized Macintosh Text-to-Speech voice of Victoria say these words: "Next Tuesday, when the sun goes down, I will play the Moonlight Sonata backwards.

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65. Ray Kurzweil, *The Age of Spiritual Machines: When Computers Exceed Human Intelligence* 178 (Viking Penguin Press, 1999).

66. *See generally* NanoTechnology, *What is Nanotechnology?* <http://www.nanozine.com/WHATNANO.HTM> (accessed Nov. 15, 2001).

67. Jessica Reaves, *Cell Phones: Unsafe at Any Speed*, Time ¶ 7 (June 12, 2001) (available at <http://www.time.com/time/health/article /0,8599,130210,00.html>).

This will reverse the effects of the world's mad plunge into suffering, for the last 200 million years."[68]

Art is not immune from the positive effects of technology. In May 2001 technology guru Ray Kurzweil unveiled the Aaron software program capable of creating museum-quality original art.[69] Artist Harold Cohen taught the software program the nuances of his art little by little over thirty years and now it is ready to be sold to the public for $19.95 US.[70]

In music, poetry, and art technology appears to be poised to take man and womankind to new heights, so why not in medicine? All those things that we value in medicine can be even better in cybermedicine, we just have to put up with some bumps in the road to get there!

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68. *See generally* Leonard Cohen, *The Great Event: More Best of Leonard Cohen* <http://www.leonardcohen.com/> (accessed Mar. 30, 2002).

69. *See generally* Ray Kurzweil, AARON: *A product of Kurzweil CyberArt Technologies* <http://www.devweb.kurzweilcyberart.com/> (accessed Nov. 5, 2001).

70. *See generally id.*